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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/662,394	09/16/2003	Yuichi Akiyama	1344.1125	2179

21171 7590 06/26/2007

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EXAMINER	
LEUNG, WAI LUN	

ART UNIT	PAPER NUMBER
2613	

MAIL DATE	DELIVERY MODE
06/26/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/662,394	AKIYAMA ET AL.	
	Examiner	Art Unit	
	Danny Wai Lun Leung	2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on *20 April 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 September 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *5/17/2007*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-6, 12, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Chou et al.** *(US006859268B2)*, in view of **Morkel** *"PMD-induced BER penalties in optically-amplified IM/DD lightwave systems", Electronics Letters, 12 May 1994 vol 30, iss 10.*

Regarding claims 1, 4, and 15, **Chou** discloses an optical transmission system *(fig 1)* in which an optical signal is transmitted from an optical transmission apparatus *(15, fig 1)* to an optical receiving apparatus *(240, fig 1)* via an optical transmission path *(22, fig 1)*, comprising:

a degree of polarization measurement section *(110, fig 1)* that measures the degree of polarization of said optical signal *(col 7, ln 44-col 8, ln 8)*. **Chou** further teaches PMD analysis may be performed from the measurement of degree of polarization *(col 7, ln 13-col 8, ln 34)*. **Chou** does not disclose expressly wherein the system comprising an optical SNR calculation section that determines an optical signal to noise ratio of said optical signal based on a measured value of the degree of polarization obtained in said degree of polarization measuring section. **Morkel**, from the same field of endeavor, teaches an optical transmission system comprising an optical SNR calculation section that determines an optical signal to noise ratio of said optical signal based on analysis of PMD *(page 807, 1st paragraph on col 1, "The Q value for each PMD*

level is then evaluated" with formula (1)). Therefore, it would have been obvious for a person of ordinary skill in the art at the time of invention to apply **Morkel's** optical SNR calculation section onto **Chou**'s system, such that **Chou's** computer 120 acts as an optical SNR calculation section that determines an optical signal to noise ratio of said optical signal based on an analysis of PMD, which is based on a measured value of the degree of polarization obtained in said degree of polarization measuring section as suggested by **Morkel**. The motivation for doing so would have been to effectively measure noise caused by polarization dispersion, such that proper compensation may be provided accordingly.

As to claim 2, **Chou** further discloses storing an initial value of said degree of polarization of said optical signal is stored *(col 7, ln 50-col 8, ln 5, the DOP is stored in the computer)*, and determining a change amount in the measured value of said degree of polarization relative to said stored initial value *(col 13, ln 57-67)*. **Chou** does not expressly teaches wherein a change amount in the optical signal to noise ratio of said optical signal is determined according to a change amount in the measured value of said degree of polarization relative to said stored initial value. However, **Morkel** teaches that the signal to noise ratio of said optical signal is determined according to the degree of polarization as discussed above *(page 807, 1st paragraph on col 1, "The Q value for each PMD level is then evaluated" with formula (1))*. Therefore, it would have been obvious for a person of ordinary skill in the art at the time of invention to determine a change amount in the optical signal to noise ratio of said optical signal in **the combination of Chou and Morkel's** system according to a change amount in the measured value of said degree of polarization relative to said stored initial value as taught by **Chou** for the same reason as stated above regarding claim 1.

As to claim 3, **Chou** further teaches wherein when the measured value of said degree of polarization exceeds said initial value, the measured value is set as said initial value *(col 14, ln 48-61, "Each data point can be used to increment a matrix, M, with very few floating operations by continuously updating M to include new data and throw out old data").*

As to claim 5, **Chou** further discloses wherein said degree of polarization measurement section measures the degree of polarization of an optical signal propagated through said optical transmission path to be input to said optical receiving apparatus *(col 5, ln 12-42 polarimeter 110 measure DOP of optical signal along path 160, which is to be input to receiver 240).*

As to claim 6, **Chou** further discloses an optical transmission system according to claim 4, further comprising:

at least one optical repeater *(100, fig 1)* on said optical transmission path, wherein,

when an optical signal sent from said optical transmission apparatus is transmitted through a plurality of repeating intervals *(100 and 200, fig 1)* to be received by said optical receiving apparatus *(240, fig 1)*,

said degree of polarization measurement section measures the degree of polarization of at least one optical signal among an optical signal output from said optical transmission apparatus each optical signal propagated through each repeating intervals and an optical signal input to said optical receiving apparatus *(col 5, ln 56-67).*

Regarding claim 12, **Chou** teaches An optical transmission system comprising:

an automatic polarization mode dispersion compensation apparatus *(700, fig 9)* including

a polarization mode dispersion compensator *(750, fig 9)* compensating for polarization mode dispersion generated in said optical signal *(col 11, ln 19-28)*,

a degree of polarization measuring device *(770, fig 9)* measuring the degree of polarization of an optical signal whose polarization mode dispersion has been compensated by said polarization mode dispersion compensator *(col 11, ln 29-41),* and

a control circuit *(780, fig 9)* controlling a compensation amount in said polarization mode dispersion compensator *(col 11, ln 41-47)*, based on the measured value of the degree of polarization obtained by the degree of polarization measuring device in said automatic polarization mode dispersion compensation apparatus *(col 11, ln 29-53).*

Chou further teaches PMD analysis may be performed from the measurement of degree of polarization *(col 7, ln 13-col 8, ln 34)*. **Chou** does not disclose expressly wherein the system comprising an optical SNR calculation section that determines an optical signal to noise ratio of said optical signal based on a measured value of the degree of polarization obtained in said degree of polarization measuring section. **Morkel**, from the same field of endeavor, teaches an optical transmission system comprising an optical SNR calculation section that determines an optical signal to noise ratio of said optical signal based on analysis of PMD *(page 807, 1st paragraph on col 1, "The Q value for each PMD level is then evaluated" with formula (1)).* Therefore, it would have been obvious for a person of ordinary skill in the art at the time of invention to apply **Morkel's** optical SNR calculation section onto **Chou**'s system, such that **Chou's** computer 120 acts as an optical SNR calculation section that determines an optical signal to noise ratio of said optical signal based on an analysis of PMD, which is based on a measured value of the degree of polarization obtained in said degree of polarization measuring section as suggested by **Morkel**, such that said optical signal to noise ratio calculation section **in the combination of Chou and Morkel's** system determines an optical signal to noise ratio of said

optical signal based on a measured result of **Chou's** degree of polarization measuring device as suggested by **Chou**. The motivation for doing so would have been to effectively measure noise caused by polarization dispersion, such that proper compensation may be provided accordingly.

3. Claims 7-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Chou et al.** *(US006859268B2)*, in view of **Morkel** *"PMD-induced BER penalties in optically-amplified IM/DD lightwave systems", Electronics Letters, 12 May 1994 vol 30, iss 10*, as applied to claim 4 above, and further in view of **Fatehi et al.** *(US006512612B1)*.

Regarding claim 7, **the combination of Chou and Morkel** discloses the system in accordance to claim 4 as discussed above. **Chou** further discloses wherein a plurality of optical signals is transmitted, and said degree of polarization measurement section measure the degrees of polarization of the respective optical signals *(col 5, ln 13-23)*. **The combination of Chou and Morkel** does not disclose expressly having wavelength division multiplexed light containing a plurality of optical signals with different wavelengths. **Fatehi**, from the same field of endeavor, teaches an optical transmission system, where a wavelength division multiplexed light containing a plurality of optical signals with different wavelengths is transmitted *(col 3, ln 61-col 4, ln 4)*, and a section *(250, fig 5)* that measures properties of the optical signals of respective wavelengths contained in said wavelength division multiplexed light *(col 9, ln 62-col 10, ln 21)*.

Therefore, it would have been obvious for a person of ordinary skill in the art at the time of invention to transmit a wavelength division multiplexed light containing a plurality of optical signals, as taught by **Fatehi**, onto **the combination of Chou and Morkel's** system with SNR calculation section and a polarization measurement section, such that **the combination of Chou**

and Morkel's degree of polarization measurement section measures the degrees of polarization of optical signals of respective wavelengths contained in said wavelength division multiplexed light, and **the combination of Chou and Morkel's** optical signal to noise ratio calculation section determines optical signal to noise ratios corresponding to respective wavelengths, based on measured values of the degrees of polarization obtained by said degree of polarization measurement section as discussed above regarding claim 4. The motivation for doing so would have been to increase the bandwidth of signal transmission while maintaining signal quality by transmitting a wavelength division multiplexed light containing a plurality of optical signals and measuring the noise of the respective signals accordingly.

As to claim 8, **Chou** further discloses wherein said degree of polarization measurement section and said optical signal to noise ratio calculation section are provided in plural number *(101 and 200, fig 1, also see 116a, 117a, and 119a, fig 2)*. It would be obvious for a person of ordinary skill in the art to use such degree of polarization measurement section and said optical signal to noise ratio calculation section provided in plural number as suggested by **Chou** for each of the optical signals of respective wavelengths contained in said wavelength division multiplexed light in **the combination of Chou, Morkel, and Fatehi's** system. The motivation for doing so would have been to be able to detect signal quality in each of the individual channels.

Claim 9 is rejected for the same reasons as stated above regarding claim 7, because in addition to the limitations in claim 7, **Chou** further teaches a selection section that selects one optical signal from the optical signals to be measured *(col 5, ln 56-col6, ln 5, "beam splitters 114, 116, 117, and mirror 119 couple optical signals propagating along beam path 112 towards*

detector modules 114a, 116a, 117a, 119a respectively... Each detector module measures specific optical properties of the optical signal... "). **Fatehi** further teaches a selection section that selects one optical signal from the optical signals to be measured *(col 11, ln 35-51).* It would have been obvious to combine **Chou, Morkel,** and **Fatehi** for the same reason as stated regarding claim 7, such that a selection section, such as that of **Chou's or Fatehi's**, selects one optical signal from the optical signals of respective wavelengths contained in **the combination of Chou, Morkel, and Fatehi's** wavelength division multiplexed light, wherein said degree of polarization measurement section measures the degree of polarization of an optical signal selected by said selection section, and said optical signal to noise ratio calculation section determines an optical signal to noise ratio of the optical signal selected by said selection section, based on the measured value of the degree of polarization obtained by said degree of polarization measurement section as discussed above regarding claim 7.

As to claim 10, **Fatehi** further discloses said selection section *(250, fig 5)* includes a demultiplexer *(202, fig 5)* demultiplexing said wavelength division multiplexed light according to wavelength, and an optical switch selecting one optical signal out of the optical signals of respective wavelengths demultiplexed by said demultiplexer *(col 11, ln 35-51).* Therefore, it would be obvious for a person of ordinary skill in the art to feed such signal from **Fatehi**'s selection section it to **the combination of Chou, Morkel, and Fatehi's** degree of polarization measurement section as discussed above regarding claim 9. The motivation for doing so would have been to reduce cost by only measuring a selected portion of the signals.

4. Claim 11 rejected under 35 U.S.C. 103(a) as being unpatentable over **Chou et al.** *(US006859268B2)*, in view of **Morkel** *"PMD-induced BER penalties in optically-amplified IM/DD lightwave systems", Electronics Letters, 12 May 1994 vol 30, iss 10*, further in view of **Fatehi et al.** *(US006512612B1)*, as applied to claim 9 above, and further in view of **Suzuki** *(US006154273A)*.

Regarding claim 11, **the combination of Chou, Morkel, and Fatehi** discloses the method in accordance to claim 9 as discussed above. **It** does not disclose expressly wherein said selection section includes a variable wavelength optical filter extracting an optical signal of one wavelength from said wavelength division multiplexed light, to feed it to said degree of polarization measurement section. **Suzuki**, from the same field of endeavor, teaches an optical transmission system having a selection section includes a variable wavelength optical filter *(62, 64, fig 12)* extracting an optical signal of one wavelength from a wavelength division multiplexed light, to feed it to a measurement section *(col 13, ln 35-62)*. Therefore, it would have been obvious for a person of ordinary skill in the art at the time of invention to use a variable wavelength optical filter such as that of **Suzuki**'s onto **the combination of Chou, Morkel, and Fatehi**'s system to extract an optical signal of one wavelength from said wavelength division multiplexed light, to feed it to said degree of polarization measurement section. The motivation for doing so would have been to reduce complexity of the measuring system by using a variable wavelength optical filter to eliminate signals that are not being measured.

5. Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Chou et al.** *(US006859268B2)*, in view of **Morkel** *"PMD-induced BER penalties in optically-*

amplified IM/DD lightwave systems", Electronics Letters, 12 May 1994 vol 30, iss 10., as applied to claim 4 above, and further in view of **Eder et al.** *(US006885820B2).*

Regarding claim 13, **the combination of Chou and Morkel** discloses the system in accordance to claim 4 as discussed above. **Chou** further discloses the system further comprising: a control section *(220, fig 1)* controlling the optical signal so that the optical signal to noise ratio of the optical signal received by said optical receiving apparatus is a previously set value. **The combination** does not disclose expressly a control section controlling a power of an optical signal output from said optical transmission apparatus, based on the optical signal to noise ratio determined by said optical signal to noise ratio calculation section, so that the optical signal to noise ratio of the optical signal received by said optical receiving apparatus is a previously set value. **Eder**, from the same field of endeavor, teaches a control section *(OSNR controller, fig 1)* controlling a power of an optical signal output from said optical transmission apparatus *(col 7, ln 41-47),*

based on the optical signal to noise ratio determined by a optical signal to noise ratio calculation section *(col 7, ln 19-47, OSNR signal controls the adjustable attenuators VOA2 and VOAn, which controls the power of optical output of the transmitter),*

so that the optical signal to noise ratio of the optical signal received by said optical receiving apparatus is a previously set value *(col 7, ln 42-54).* Therefore, it would have been obvious for a person of ordinary skill in the art at the time of invention to apply a control section controlling the power of an optical signal output from the combination of Chou and Morkel's transmission apparatus, based on the optical signal to noise ratio determined by the combination of Chou and Morkel's signal to noise ratio calculation section, so that the optical signal to noise

ratio of the optical signal received by said optical receiving apparatus is a previously set value as taught by **Eder**. The motivation for doing so would have been to achieve the optimum optical signal to noise ratio by adjusting transmission power.

As to claim 14, **Eder** further discloses wherein, when a wavelength division multiplexed light containing a plurality of optical signals with different wavelengths is transmitted *(col 7, ln 1-14)*,

said control section performs a pre-emphasis control of the optical signal power of each wavelength output from said optical transmission apparatus *(col 7, ln 41-54)*,

based on the optical signal to noise ratio corresponding to each wavelength determined by said optical signal to noise ratio calculation section *(col 7, ln 14-36)*.

Response to Arguments

6. Applicant's arguments filed 4/20/2007 have been fully considered but they are not persuasive.

7. Applicant argues that **Morkel** does not teach or suggest determining the SNR based on the DOP, but rather the increase of the BER is determined in relation to the PMD which is different from DOP. However, **Chou** teaches PMD analysis may be performed from the measurement of degree of polarization *(col 7, ln 13-col 8, ln 34)*. Therefore, it would have been obvious for a person of ordinary skill in the art at the time when the invention was made to determine the SNR based on PMD, as suggested by **Morkel**, which may be analyzed based on DOP measured by **Chou's** apparatus. Therefore, 103 rejections for claims 1-15 are hereby maintained.

Conclusion

8. The prior art made of record in previous action(s) and not relied upon is considered pertinent to applicant's disclosure.

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Danny Wai Lun Leung whose telephone number is (571) 272-5504. The examiner can normally be reached on 9:30am-9:00pm Mon-Thur.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on (571) 272-3022. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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June 22, 2007

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